Draft Staff Report

Amendments to Regulation 2-1 General Requirements Regulation 2-2 New Source Review Regulation 3 Fees for Semiconductor Manufacturing Operations

April 24, 1999

INTRODUCTION

The Bay Area Air Quality Management District is proposing to amend Regulation 2, Rules 1 and 2, and Regulation 3 to revise the permit exemptions, Best Available Control Technology (BACT) Certification procedures, and permit fees for semiconductor manufacturing operations. The purpose of the proposed amendments is to implement improvements to the rules identified during the recent development of the Permit Handbook Chapter for semiconductor wafer fabrication operations. These improvements include:

- Provide and amend semiconductor manufacturing related definitions, where referenced in Regulations 2, Rules 1, and Regulation 3;
- Revise permit exemptions for semiconductor manufacturing operations;
- Replace Semiconductor Fabrication Area BACT Certification with a clarified application process; and
- Revise Schedule H of Regulation 3.

BACKGROUND

During the second part of 1997, a workgroup of District staff and semiconductor industry representatives met several times to review current industry practice, District permitting procedures related to this industry and applicable regulations. As a result of these meetings, a new draft Permit Handbook Chapter was developed. The Permit Handbook Chapter provides guidelines for consistent permitting procedures for the semiconductor industry. The second product of this collaborative effort was amendments of Regulation 8, Rule 30, which were adopted in October 1998. The third phase of this collaborative effort is the proposal to amend Regulation 2, Rules 1 and 2, and Regulation 3 to improve and streamline the permitting process for semiconductor manufacturing operations.

AFFECTED FACILITIES AND EMISSIONS

Staff has identified about 230 facilities, which are potentially affected by these amendments. Because the proposed amendments are administrative permitting changes, there will have no effect on emissions. These facilities would benefit from the proposed amendments because it will give them more flexibility in their operations.

ASSOCIATED IMPACTS

The District has determined that these amendments to Regulation 2, Rules 1 and 2, and Regulation 3 are exempt from provisions of the California Environmental Quality Act pursuant to Public Resource Code Section 21080 and State CEQA Guidelines, Section 15061, subd. (b)(3), and Section 15308. The amendments are administrative in nature and will not cause or contribute to any violation of any state or federal air quality standard; and do not endanger the environment. The proposed amendments can therefore be seen with certainty to have no environmental impacts and are exempt under Guidelines Section 15061, subd (b)(3). The District intends to file a Notice of Exemption pursuant to State CEQA Guidelines, Section 15062.

In addition, because this action is taken by the District, as authorized by state law, in order to assure the maintenance, restoration, enhancement, and protection of the environment, and the regulatory process involves procedures for the protection of the environment, the action is exempt pursuant to CEQA Guidelines Section 15038.

SUMMARY OF PROPOSED AMENDMENTS

A. REGULATION 2, RULE 1

Regulation 2-1 includes permit exemptions for various sources, including equipment and operations involved in semiconductor manufacturing operations.

1. Definition of Semiconductor Fabrication Area

Although an exemption for Semiconductor Manufacturing appears in this rule, no definition is provided for this type of source. Staff recommends the following definition, which is consistent with the guidelines in the semiconductor manufacturing permit handbook chapter, be added to section 2-1-200:

> **2-1-231** **Semiconductor Fabrication Area:** A physically identifiable area in a semiconductor manufacturing facility where one or more specific operations in the fabrication of semiconductors or related solid state devices occurs within the same cleanroom environment and which is permitted as a single source. Areas within the facility, which are separated by non-cleanroom hallways or rooms, shall not be grouped together as part of the same source.

2. Permit Exemption Basis for Semiconductor Fabrication Area

Regulation 2-1-124.1.5 currently provides a permit exemption for solvent stations and for wet chemical stations based on the total liquid capacity of each of these operations. This exemption structure was originally used because most solvent stations and wet chemical stations were liquid-phase operations, and it was convenient for District inspectors to simply count the total amount of liquid capacity to determine if an exemption was valid. However, a growing proportion of solvent stations and wet chemical stations use liquid sprays or solvent vapors instead of sinks, making the "total capacity" more difficult to establish. Also, it has become clear in several fab area permits that liquid capacity is no longer a good indicator of actual liquid throughput and the resulting emissions. Therefore, for consistency with many other exemptions, Staff recommends that the exemption basis for these operations be changed to an organic throughput basis. In addition, rather than distinguish the type of equipment within a semiconductor fab that may be exempt within a fab, Staff recommends that the amended exemption will be based on the total organic throughput through the entire semiconductor manufacturing fab. This change must be made in conjunction with the changes recommended for Regulation 3 ("Fees").

2-1-124 Exemption, Semiconductor Manufacturing: Semiconductor fabrication area(s) at a facility, which complies with all of the following are exempt from the requirements of Sections 2-1-301 and 302, provided that the equipment is not subject to any of the requirements of Section 2-1-316 through 318.

124.1 Consumes a total of less than 20 gallons of solvent per year on a facility wide basis, or which emits to the atmosphere less than 150 lb/year of VOC on a facility wide basis, resulting from the usage of solvent, and

124.2 Consumes a total of less than than 30 gallons of maskant and/or coating per year on a facility wide basis, or emits less than 150 pounds per year of uncontrolled VOC on a facility wide basis, resulting from the application of maskant and/or coating.

~~124.1 Semiconductor fabrication equipment:~~

~~1.1 Ion implantation.~~

~~1.2 Vacuum deposition.~~

~~1.3 Sputtering.~~

~~1. 4 Plasma etching or ashing.~~

~~1. 5 Solvent or acid cleaning wet chemical stations with an aggregate capacity of 100 gallons or less per fabrication area~~.

~~124.2 Semiconductor fabrication operations:~~

2.1 ~~Wafer coating, solvent application, photomask fabrication, or equipment cleaning operations which use solutions containing less than 1% (weight) VOC.~~

~~2.2 Any gaseous process operation, including ion implanation, vacuum deposition, sputtering, and plasma etching or ashing, with air toxic contaminant emissions less than the quantities specified in Section 2-1-316.~~

~~2.3 Buffing, polishing, carving, cutting, drilling, lapping, machining, routing, sanding, sawing, surface grinding or turning of semiconductor wafers~~.

(Adopted 10/19/83; Amended 1/9/85; 4/16/86; 7/17/91; 6/7/95)

B. REGULATION 2, RULE 2

1. Regulation 2-2-420

This section of the regulation was intended to provide a streamlined process for facilities to replace individual elements of a fab area without first securing an authority to construct. This process is desirable because semiconductor equipment becomes obsolete and is replaced after a relatively short period of time, compared to other industries. However, this section is unnecessary based on the proposed amendments, which clarify that the semiconductor fabrication area is the source and not its various equipment components. A permit modification of this source would be required for increases in organic and/or toxics throughput or emissions of the semiconductor fabrication area rather than looking at each component within the source. As a result, Staff recommends that this section be eliminated.

~~**2-2-420 Semiconductor Fabrication Area, Annual BACT and Offset Certification:** Upon written request by an owner or operator of a Semiconductor Fabrication Area (Fab Area), the APCO shall certify which specific pieces of equipment, comprising a Fab Area, are being controlled to the current District BACT levels. After the initial BACT certification, the facility must reapply in writing at the time of annual permit renewal for recertification by the APCO. Thereafter, any piece of equipment within a Fab Area that is currently BACT certified may be replaced with a functionally equivalent device, without first obtaining an authority to construct from the District provided that:~~

~~420.1 The APCO has issued a certification in writing specifying that the piece of equipment being replaced is being controlled to current BACT levels;~~

~~420.2 Offsets are supplied in quantities required by Section 2-2-302, to the satisfaction of the APCO, by the permittee at the time of annual permit renewal for all such equipment replacements;~~

~~420.3 The emission limits for the semiconductor fabrication area are reset to the highest levels demonstrated, to the satisfaction of the APCO, for any twelve (12) consecutive month period occurring during the last five years; and~~

~~420.4 The APCO is advised in writing of any equipment replacement within 30 days of the replacement and provided that no changes in the Fab Area permit conditions are required due to the replacement.~~

(Amended June 15, 1994)

C. REGULATION 3

1. Regulation 3 Definitions

Regulation 3 includes definitions for solvent and wet chemical stations, semiconductor fabrication areas and photoresist lines. However, these definitions are no longer necessary due to the proposed amendments, which clarify that the semiconductor fabrication area is the source and not its various equipment components. Fees will also be based organic throughput and not equipment composition. As a result, Staff recommends that the following definitions be deleted from Regulation 3:

~~**3-214 Fabrication Area:** A physically identifiable area in a semiconductor manufacturing facility where one or more specific operations in the fabrication of semiconductors or related solid state devices occurs. Semiconductor fabrication includes all processing from crystal growth~~

~~through circuit separation and encapsulation. Examples of semiconductor operations are: crystal growth, diffusion operations, photoresist operations, and wafer processing.(Adopted January 9, 1985)~~

~~**3-215** **Solvent Station:** Any operation in a semiconductor fabrication area whose primary purpose is to remove surface contaminants or excess photoresist using a liquid or vapor containing organic compounds. (Adopted January 9, 1985)~~

~~**3-216** **Wet Chemical Station:** Any work station in a semiconductor fabrication area in which inorganic compounds (acids, bases, salts) and/or aqueous solutions containing less than 10% (by volume) of water soluble organic compounds are used. Examples of wet chemical operations are: etching, chemical milling, tube cleaning, and acid cleaning and stripping. (Adopted January 9, 1985)~~

~~**3-217** **Siliconizing Reactor:** A semiconductor processing unit used for growing or depositing silicon on wafers. (Adopted January 9, 1985)~~

~~**3-218** **Chemical Vapor Deposition Reactor**: A semiconductor processing unit used for deposition on non-metallic layers such as silicon nitride and silicon dioxide on wafers. A vacuum deposition reactor is a reactor that is operated at a pressure well below atmospheric.(Adopted January 9, 1985)~~

~~**3-219** **Diffusion Furnace:** A semiconductor processing unit used for deposition and/or diffusion dopants. (Adopted January 9, 1985)~~

~~**3-220** **Alloy and Annealing Furnaces:** Semiconductor processing units used for wafer heat treatment processes. (Adopted January 9, 1985)~~

~~**3-221** **Oxidation Furnace:** A semiconductor processing unit used to oxidize the surface layer of a wafer. (Adopted January 9, 1985)~~

~~**3-222** **Photoresist Line:** Semiconductor manufacturing equipment used to apply, develop and bake photoresist. Process includes preparation (except primary cleaning), soft bake, develop and hard bake.~~

~~222.1 Photoresist Applicator: A semiconductor processing unit used to coat wafers with photoresist. Where multiple applicators (spinners) are enclosed in a single piece of equipment, each applicator will be counted for permit purposes.~~

~~222.2 Photoresist Developer: A semiconductor processing unit used to develop the photoresist after the photolithographic process. Where multiple developers are enclosed in a single piece of equipment, each developer will be counted for permit purposes. (Adopted January 9, 1985)~~

2. Regulation 3, Schedule H

a. This section of the regulation lists the fees for each element in a fab area. The preamble contains permitting guidelines, which are not completely consistent with this permit handbook chapter and Staff recommends that these inconsistent sections be deleted or revised.

b. As discussed in the recommended changes to Regulation 2, Rule 1, Staff recommends the basis for solvent station and wet chemical station exemptions be based on throughput instead of liquid capacity. The fees for solvent and wet chemical stations are currently based on liquid capacity. For consistency with the recommended exemption basis changes, Staff recommends that fees for solvent and wet chemical stations be based on organic throughput. The throughput fees were developed to be consistent with the net throughput fees of Schedule E with an additional 15% fee increase to reflect the “across-the-board” fee increase currently proposed. In addition, Staff recommends that reference to the specific equipment of the semiconductor manufacturing fab be eliminated due to the proposed amendments, which clarify that the semiconductor manufacturing fab are is the source and not its various components.

c. Staff recommends that the wording of the photoresist line fees should be changed to reflect the fact that this fee applies to any kind of wafer coating and be on organic throughput.

d. Staff recommends that the fees for currently exempt equipment be deleted since they are exempt from permits and require no fees.

e. The conversion between gigajoules and MM BTU should be deleted since it is not applicable to this fee schedule.

SCHEDULE H
SEMICONDUCTOR AND RELATED OPERATIONS
(Adopted May 19, 1982)

~~For the following sources utilized primarily for manufacturing semiconductor and related solid state devices, as described under Standard Industrial Classification (SIC) Number 3674, the fee shall be based upon the quantity of equipment which a fabrication area is authorized to contain.~~

All of the equipment within a fabrication area will be grouped together and considered one source. ~~Grouping will be limited to equipment subject to this schedule. Equipment not subject to this schedule will be permitted separately, item by item~~.

~~Permits for sources covered by this Schedule will be written in a format that specifies the maximum amount of equipment that is authorized for the fabrication area.~~ Equipment may be moved into and out of any fabrication area; such changes ~~shall~~ are not ~~be considered~~ a modification (as defined in Section 1-217 ~~and requiring an Authority to Construct~~) that requires an Authority to Construct.~~provided that the maxima indicated on the permit are not exceeded.~~

~~Initial fees for new or modified equipment shall be based upon the increase in permitted equipment of each category (no credit for reductions). Permit to Operate fees shall be based on permitted maxima.~~
(Amended June 4, 1986)

The fee shall be as indicated:

1. INITIAL FEE:

   a. The minimum fee per source is $140.
   b. The maximum fee per source is $11,090.

   The initial fee shall include the fees for each type of operation listed below, which is performed at the fab area:

   a. SOLVENT CLEANING OPERATIONS, such as usage of
   Solvent Sinks (as defined in Regulation 8-30-214),
   Solvent Spray Stations (as defined in Regulation 8-30-221),
   Solvent Vapor Stations (as defined in Regulation 8-30-222), and
   Wipe Cleaning Operation (as defined in Regulation 8-30-225):
   The fee is based on the gross throughput of organic solvent processed through the solvent sinks on an annual basis (or anticipated to be processed, for new sources):
   $140 if gross throughput is not more than 3,000 gal/yr.
   $276 per 3,000 gallons if gross throughput is 3,000 gal/yr or more.

   b. COATING OPERATIONS, such as application of
   Photoresist (as defined in Regulation 8-30-215),
   Solvent-Based Photoresist Developer (as defined in Regulation 8-30-219), and
   OTHER MISCELLANEOUS SOLVENT USAGE:
   The fee is based on the gross throughput of organic solvent processed through the wafer coating applicators on an annual basis (or anticipated to be processed, for new sources):
   $140 if gross throughput is not more than 1,000 gal/yr.
   $276 per 1,000 gallons if gross throughput is 1,000 gal/yr or more.

   ~~a. SOLVENT STATIONS:~~
   ~~cumulative capacity not exceeding 100 gallons $0~~
   ~~cumulative capacity exceeds 100 gallons $610~~

   ~~b. WET CHEMICAL STATIONS:~~
   ~~cumulative capacity not exceeding 100 gallons $0~~
   ~~cumulative capacity exceeds 100 gallons $610~~

   ~~c. SILICONIZING REACTORS: $121 per authorized Reactor~~

~~d. DIFFUSION, OXIDIZING, ALLOYING AND ANNEALING FURNACES — $36 per authorized Furnace Chamber~~

~~e. CHEMICAL VAPOR DEPOSITION REACTORS (Excluding Vacuum Deposition) — $121 per authorized Reactor~~

~~f. PHOTORESIST LINES: — $60 per authorized Photoresist Applicator~~
~~$60 per authorized Photoresist Developer~~

~~(Amended May 19, 1982; October 17, 1984; June 4, 1986; July 3, 1991)~~

2. PERMIT TO OPERATE FEE:

a. The minimum fee per source is $100.
b. The maximum fee per source is $5,545.

The initial fee shall include the fees for each type of operation listed below, which is performed at the fab area:

a. SOLVENT CLEANING OPERATIONS, such as usage of
Solvent Sinks (as defined in Regulation 8-30-214),
Solvent Spray Stations (as defined in Regulation 8-30-221),
Solvent Vapor Stations (as defined in Regulation 8-30-222), and
Wipe Cleaning Operation (as defined in Regulation 8-30-225):
The fee is based on the gross throughput of organic solvent processed through the solvent sinks on an annual basis (or anticipated to be processed, for new sources):
$100 if gross throughput is not more than 3,000 gal/yr.
$140 per 3,000 gallons if gross throughput is 3,000 gal/yr or more.

b. COATING OPERATIONS, such as application of
Photoresist (as defined in Regulation 8-30-215),
Solvent-Based Photoresist Developer (as defined in Regulation 8-30-219), and
OTHER MISCELLANEOUS SOLVENT USAGE:
The fee is based on the gross throughput of organic solvent processed through the wafer coating applicators on an annual basis (or anticipated to be processed, for new sources):
$100 if gross throughput is not more than 1,000 gal/yr.
$140 per 1,000 gallons if gross throughput is 1,000 gal/yr or more.

~~a. SOLVENT STATIONS:~~
~~cumulative capacity not exceeding 100 gallons — $0~~
~~cumulative capacity exceeds 100 gallons — $305~~

~~b. WET CHEMICAL STATIONS:~~
~~cumulative capacity not exceeding 100 gallons — $0~~
~~cumulative capacity exceeds 100 gallons — $305~~

~~c. SILICONIZING REACTORS: — $60 per authorized Reactor~~

~~d. DIFFUSION, OXIDIZING, ALLOYING AND ANNEALING FURNACES — $18 per authorized Furnace Chamber~~

~~e. CHEMICAL VAPOR DEPOSITION REACTORS (Excluding Vacuum Deposition) — $60 per authorized Reactor~~

~~f. PHOTORESIST LINES: — $30 per authorized Photoresist Applicator~~
~~$30 per authorized Photoresist Developer~~

(Amended 1/9/85; 6/5/85; 6/4/86; 7/3/91; 6/15/94; 7/1/98)

3. Fees for each source will be rounded to the nearest dollar. The fee for sources will be rounded up to the nearest dollar for 51 cents and above, and amounts 50 cents and lower will be rounded down to the nearest dollar. (Adopted June 5, 1985)

4. Toxic Surcharge Fee: The initial fee shall be doubled and the permit to operate fee shall be raised by ten percent, for sources which emit one or more toxic air contaminant (TAC), identified by the Air Resources Board, at a rate which exceeds the trigger levels listed in Table 2-1-316 of Regulation 2, Rule 1. This fee shall not be assessed for TACs not listed in Table 2-1-316.

(Adopted June 4, 1986, Amended October 8, 1997)

~~NOTE: MM BTU is million BTU~~
~~One MM BTU/HR = 1.06 gigajoules/HR~~

COMMENTS

On May 26, 1999 a public workshop was held on the proposed amendments to Regulation 2, Rules 1 and 2, and Regulation 3 at the Isaac Newton Auditorium in the Santa Clara County Government Center (1st Floor, East Wing) at 70 West Hedding Street in San Jose.

Written and verbal comments were received during the workshop and two weeks thereafter. The following is a summary of the comments and the District responses to comments for the proposed amendments.

CONCLUSION

Section 40728.5 of the Health and Safety Code requires districts to assess the socioeconomic impacts of amendments to regulations that, "...will significantly affect air quality or emissions limitations." This regulatory proposal does not fall within the scope of an amendment that significantly affects air quality or emissions limitations.

Under Health and Safety Code Section 40920.6, the District is required to perform an incremental cost analysis for a proposed rule. To perform this analysis, the District must (1) identify one or more control options achieving the emission reduction objectives for the proposed rule, (2) determine the cost effectiveness for each option, and (3) calculate the incremental cost effectiveness for each option. To determine incremental costs, the District must "calculate the difference in the dollar costs divided by the difference in the emission reduction potentials between each progressively more stringent potential control option as compared to the next less expensive control option." This section of the Health and Safety Code is not applicable to this amendment. There is no identifiable cost to this project as there is no change in the regulatory standards or emission limitations.

AB 1061, which was signed by the Governor in September 1997 and became effective January 1, 1998, adds Section 40727.2 to the Health and Safety Code and imposes new requirements on the adoption, amendment, or repeal of air district regulations. The bill requires a district to identify existing federal and district air pollution control requirements for the equipment or source type affected by the proposed change in district rules. The district must then note any differences between these existing requirements and the requirements imposed by the proposed change. Where the district proposal does not impose a new standard, make an existing standard more stringent, or impose new or more stringent administrative requirements, the district may simply note this fact and avoid the analysis otherwise required by the bill.

These proposed amendments do not impose any different standards, therefore, Section 40727.2 does not apply.

The District has determined that these amendments to Regulation 2, Rules 1 and 2, and Regulation 3 are exempt from provisions of the California Environmental Quality Act pursuant to State CEQA Guidelines, Section 15061, subd. (b)(3), and Section

15308. The amendments are administrative in nature. They can therefore be seen with certainty to have no environmental impacts and are exempt under CEQA Guidelines Section 15061, subd (b)(3). The District intends to file a Notice of Exemption pursuant to State CEQA Guidelines, Section 15062.

Pursuant to Section 40727 of the California Health and Safety Code, regulatory amendments must meet findings of necessity, authority, clarity, consistency, non-duplication, and reference. The proposed amendments are:

- Necessary to provide relief from administrative requirements consistent with already provided relief for continuous emission monitors.
- Authorized by Sections 40000, 40001, 40702, and 40725 through 40728 of the California Health and Safety Code;
- Written or displayed so that their meaning can be easily understood by the persons directly affected by them;
- Consistent with other District rules, and not in conflict with state or federal law;
- Non-duplicative of other statutes, rules, or regulations; and
- Are implementing, interpreting, or making specific the provisions of California Health and Safety Code Sections 40000 and 40702.

The proposed amendments will have met all legal noticing requirements and have been discussed with all interested parties. District staff recommends adoption of the amendments as proposed.